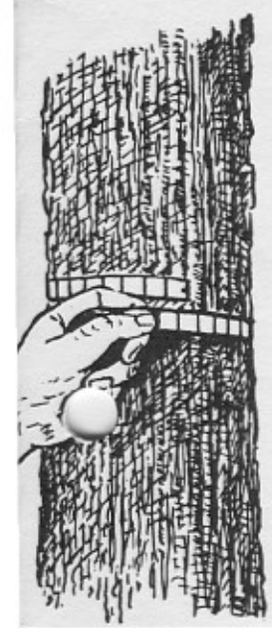

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LOBLOLLY PINE RELEASE STUDY

REPORT NUMBER

18

Virginia
Department of Forestry

LOBLOLLY PINE RELEASE
Report #18
By Thomas A. Dierauf

ABSTRACT

This study included two treatments: no release and aerial application of 2 pounds active ingredient of 2,4,5,-T per acre during the third growing season. Hardwood competition was moderate. At age 16, released plots averaged 29 percent more basal area and 48 percent more volume in standard cords than check plots, and cordwood yields were related to both a free-to-grow index estimated at age 3 (r^2 = .910) and hardwood basal area measured at age 16 (r^2 = .761).

INTRODUCTION

This is the eighteenth in a series of Occasional Reports concerning release of loblolly pine seedlings from hardwood competition. This study was installed on the privately-owned Burruss tract in Appomattox County, in the central Piedmont of Virginia. The previous stand was hardwood. Site preparation consisted of drum-chopping and burning in the summer of 1972, followed by planting in March of 1973. Part of the tract was released in July of 1975, during the third growing season, by aerial spraying, using 2 pounds active ingredient of 2,4,5-T per acre in a total volume of about 5 gallons per acre.

GROWTH PLOT INSTALLATION

Permanent 1/10-acre growth plots were installed in March of 1976, at age 3. Ten plots were installed, five each in the released and unreleased portions of the tract (Figure 1). Volunteer Virginia pine and shortleaf pine seedlings were pulled up or cut down when the plots were installed. Hardwood competition was moderate, with white oak the most serious competitor and scarlet oak, chestnut oak, and red maple providing most of the remaining competition.

Measurements were made at age 3, when the plots were installed, and again at ages 7, 11, and 16. At age 3, all loblolly pine seedlings were measured for height to the nearest foot, and classified as to free-to-grow status using a four part classification system.1/ At later measurements, diameter at breast height of each loblolly pine was measured to the nearest inch, and a sample of trees in each diameter class was measured for total height to the nearest foot, noting which trees were dominant or codominant. For the final

1/ See Occasional Report 78 (Release Report 11) for a description and discussion of this classification system.

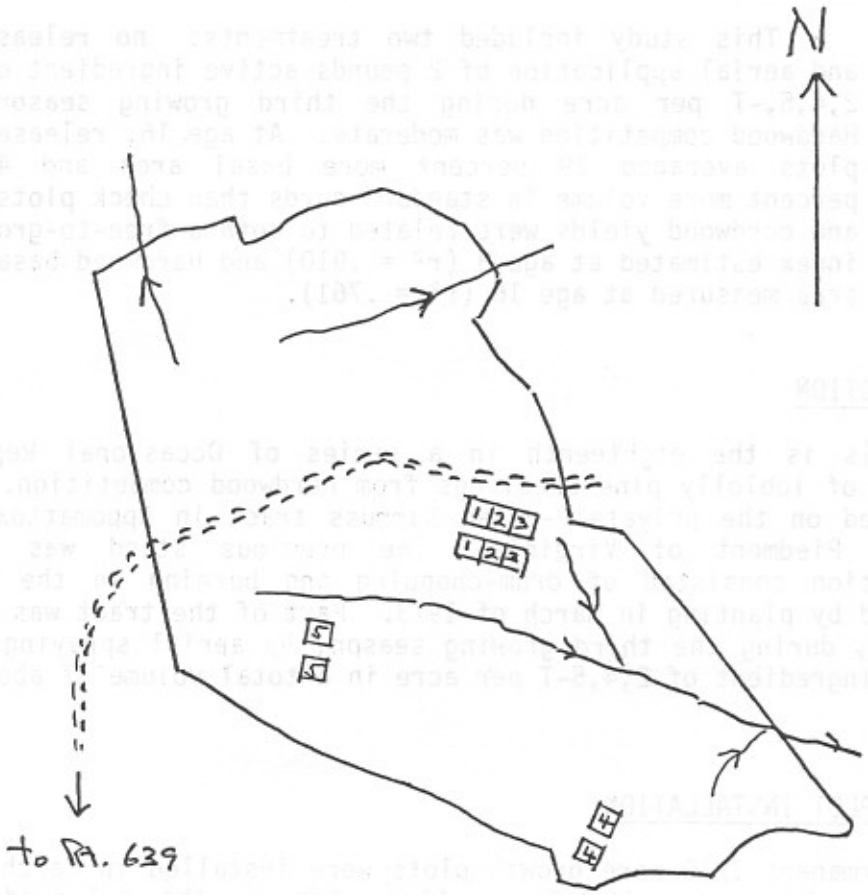

Figure 1. Layout of growth plots. Check plots are toward the drainage in plot pairs 1, 2, 3, and 5, and against the southern boundary of the tract for plot pair 4.

measurement, at age 16, all hardwoods over .5 inch DBH were tallied by species, 1-inch diameter class, and crown class. Total height to the nearest foot was measured on all intermediate hardwoods (there were no codominant or dominant hardwoods).

RESULTS AND DISCUSSION

A summary of loblolly pine data for the four measurements is presented in Table 1. At age 16, released plots averaged 8.0 standard cords per acre more than check plots.2/ Differences due to release increased with time (Table 2). Table 3 presents stand tables for loblolly pine at age 16.

A summary of average hardwood data at the final measurement at age 16 is presented in Tables 4 and 5, and individual plot data is presented in Table 6. Compared to check plots, released plots had about two-thirds the number of hardwoods and two-thirds the hardwood basal area. Most of the hardwoods were in an overtopped position by age 16, with a few intermediates and no dominants or codominants.

Cordwood yields of loblolly pine were related to the amount of hardwood present. Figure 2 shows pine cordwood yields related to hardwood basal area at age 16, for the 10 plots. A simple linear regression fitted to these data accounted for 76 percent of the variation in cordwood yields.3/

Cordwood yields also correlated well with the average free-to-grow index for each plot at age 3; in fact, the correlation was better than with hardwood basal area at age 16. Table 7 shows the percent of trees in each free-to-grow class for each plot, at age 3. In Figure 3, pine cordwood yields at age 16 are plotted over average free-to-grow index at age 3 for each plot. A simple linear regression fitted to these data accounted for 91 percent of the variation in cordwood yields.4/

Dominant and codominant loblolly pines have grown faster on the released plots. Average height differences were .4, 1.4, 1.5, and 2.6 feet at age 3, 7, 11, and 16, respectively (Table 1). There is nothing to suggest that site index should be higher on the released plots. In fact, for four plot pairs, the check plots are located down slope, toward the drainage, from the released plots. If anything, site index might be expected to be somewhat higher on

2/ Standard cords at age 16 were subjected to a t test for paired plots (caution should be used in interpreting the results of this test, because treatments could not be randomized). Yields on released plots were significantly greater than on check plots (probability of a larger t = .011).

3/ Estimated standard cords = 32.12 - .5827 (hardwood basal area), r^2 = .761, probability of a larger F = .001.

4/ Estimated standard cords = 43.66 - 14.9120 (free-to-grow index at age 3), r^2 = .910, probability of a larger F = .00002.

Table 1. A summary of loblolly data at ages 3, 7, 11, and 16: number of trees per acre, average DBH, basal area per acre, standard cords per acre, and average height of dominant and codominant trees.*

	Check Plots					Released Plots					
Age	Plot	No.	DBH	B.A.	Cds.	Ht.	Plot	No.	DBH	B.A.	Cds.	Ht.
3	1	490	-	-	-	4.7	1	580	-	-	-	5.1
	2	580	-	-	-	4.8	2	510	-	-	-	5.0
	3	450	-	-	-	4.4	3	560	-	-	-	5.4
	4	640	-	-	-	5.3	4	660	-	-	-	5.4
	5	640	-	-	-	4.9	5	750	-	-	-	5.1
Means		560	-	-	-	4.8		612	-	-	-	5.2
7	1	470	2.89	23.1	-	17.2	1	580	3.35	38.3	-	18.7
	2	580	2.86	27.3	-	17.5	2	510	3.35	32.7	-	18.2
	3	430	2.59	18.5	-	18.5	3	560	3.52	39.9	-	19.3
	4	630	3.14	36.3	-	19.8	4	660	3.18	38.3	-	19.6
	5	630	2.76	28.9	-	14.6	5	750	3.06	41.3	-	18.9
Means		548	2.85	26.8	-	17.5		612	3.29	38.1	-	18.9
11	1	470	4.87	63.4	4.7	29.7	1	570	5.40	95.1	9.7	31.9
	2	560	4.64	68.3	4.8	29.8	2	510	5.43	84.9	8.6	31.9
	3	390	4.74	51.8	4.4	30.8	3	550	5.62	96.7	10.8	33.2
	4	630	4.75	82.1	7.1	32.5	4	650	4.89	88.7	8.4	31.6
	5	630	4.33	70.2	4.9	30.4	5	750	4.88	103.0	9.3	31.8
Means		536	4.67	67.2	5.2	30.6		606	5.24	93.7	9.4	32.1
16	1	470	6.19	103.2	15.3	39.3	1	550	6.58	135.5	23.6	43.6
	2	560	6.09	117.4	17.3	39.7	2	500	6.92	135.3	24.2	42.4
	3	370	6.30	86.7	13.6	41.2	3	550	6.80	142.0	25.7	43.0
	4	620	5.98	128.6	21.4	42.6	4	650	6.08	136.6	23.2	43.4
	5	590	5.47	103.5	15.0	40.9	5	740	5.89	147.8	25.9	44.1
Means		522	6.01	107.9	16.5	40.7		598	6.45	139.4	24.5	43.3

* Except at age 3, where heights presented are for all trees.

Table 2. Average differences between check and released plots at each measurement, for basal area and standard cords per acre.

	Released minus Check	
Age	Basal Area	Std. Cds.
7	11.3	---
11	26.5	4.2
16	31.5	8.0

Table 3. Average number of loblolly pines per acre by diameter class at age 16.

DBH	Check Plots	Released Plots
1	0	2
2	14	6
3	16	10
4	50	34
5	98	62
6	136	182
7	146	196
8	46	86
9	14	16
10	2	4
Totals	522	598

Table 4. Average numbers of hardwoods per acre by species and diameter class at age 16.

Check Plots

Species	DBH 1	2	3	4	5	6	Totals
White oak	606	180	76	18	10	2	892
Red oak	204	68	12	4			288
Red maple	276	38					314
Chestnut oak	42	20					62
Blackgum	172	2					174
Dogwood	56						56
Hickory	156	8					164
Yellow-poplar	134	6					140
Miscellaneous	86	6					92
Totals	1732	328	88	22	10	2	2182

Released Plots

Species	DBH 1	2	3	4	5	6	Totals
White oak	182	80	14	4	2		282
Red oak	192	28	6	2			228
Red maple	532	90	6	2			630
Chestnut oak	46	12	2	4			64
Blackgum	24						24
Dogwood	60	2					62
Hickory	102	8					110
Yellow-poplar	74	12					86
Miscellaneous	20	6					26
Totals	1232	238	28	12	2		1512

Table 5. Average numbers of hardwoods per acre by diameter class and crown class, and basal area by crown class, at age 16.

Check Plots

DBH	Over-topped	Intermediate	Codominant	Dominant	Totals
1	1732				1732
2	328				328
3	80	8			88
4	6	16			22
5		10			10
6		2			2
Totals	2146	36			2182
B.A.	21.1	3.5			24.6

Released Plots

DBH	Over-topped	Intermediate	Codominant	Dominant	Totals
1	1232				1232
2	236	2			238
3	20	8			28
4	6	6			12
5		2			2
Totals	1494	18			1512
B.A.	13.4	1.2			14.6

Table 6. Numbers of hardwoods by diameter class and crown class, and basal area by crown class, on each 1/10-acre plot.

Plot - Check #1

DBH	O	I	CD	D	Totals
1	141				141
2	27				27
3	4				4
4	2	1			3
5					
6					
Totals	174	1			175
BA	1.73	.09			1.82

Plot - Check #2

DBH	O	I	CD	D	Totals
1	140				140
2	28				28
3	12	1			13
4		3			3
5		1			1
6					
Totals	180	5			185
BA	1.96	.45			2.41

Plot - Check #3

DBH	O	I	CD	D	Totals
1	172				172
2	46				46
3	11	2			13
4	1	1			2
5		2			2
6		1			1
Totals	230	6			236
BA	2.57	.65			3.22

Plot - Check #4

DBH	O	I	CD	D	Totals
1	212				212
2	28				28
3	3				3
4					
5					
6					
Totals	243				243
BA	1.91				1.91

Plot - Check #5

DBH	O	I	CD	D	Totals
1	201				201
2	35				35
3	10	1			11
4		3			3
5		2			2
6					
Totals	246	6			252
BA	2.35	.58			2.93

Plot - Released #1

DBH	O	I	CD	D	Totals
1	132				132
2	35				35
3	4	1			5
4	1				1
5		1			1
6					
Totals	172	2			174
BA	1.77	.18			1.95

Plot - Released #2

DBH	O	I	CD	D	Totals
1	122				122
2	28				28
3	3				3
4					
5					
6					
Totals	153				153
BA	1.42				1.42

Plot - Released #3

DBH	O	I	CD	D	Totals
1	129				129
2	21	1			22
3	1	1			2
4					
5					
6					
Totals	151	2			153
BA	1.21	.07			1.28

Plot - Released #4

DBH	O	I	CD	D	Totals
1	152				152
2	20				20
3	2	1			3
4	1				1
5					
6					
Totals	175	1			176
BA	1.45	.05			1.50

Plot - Released #5

DBH	O	I	CD	D	Totals
1	81				81
2	14				14
3		1			1
4	1	3			4
5					
6					
Totals	96	4			100
BA	.83	.31			1.14

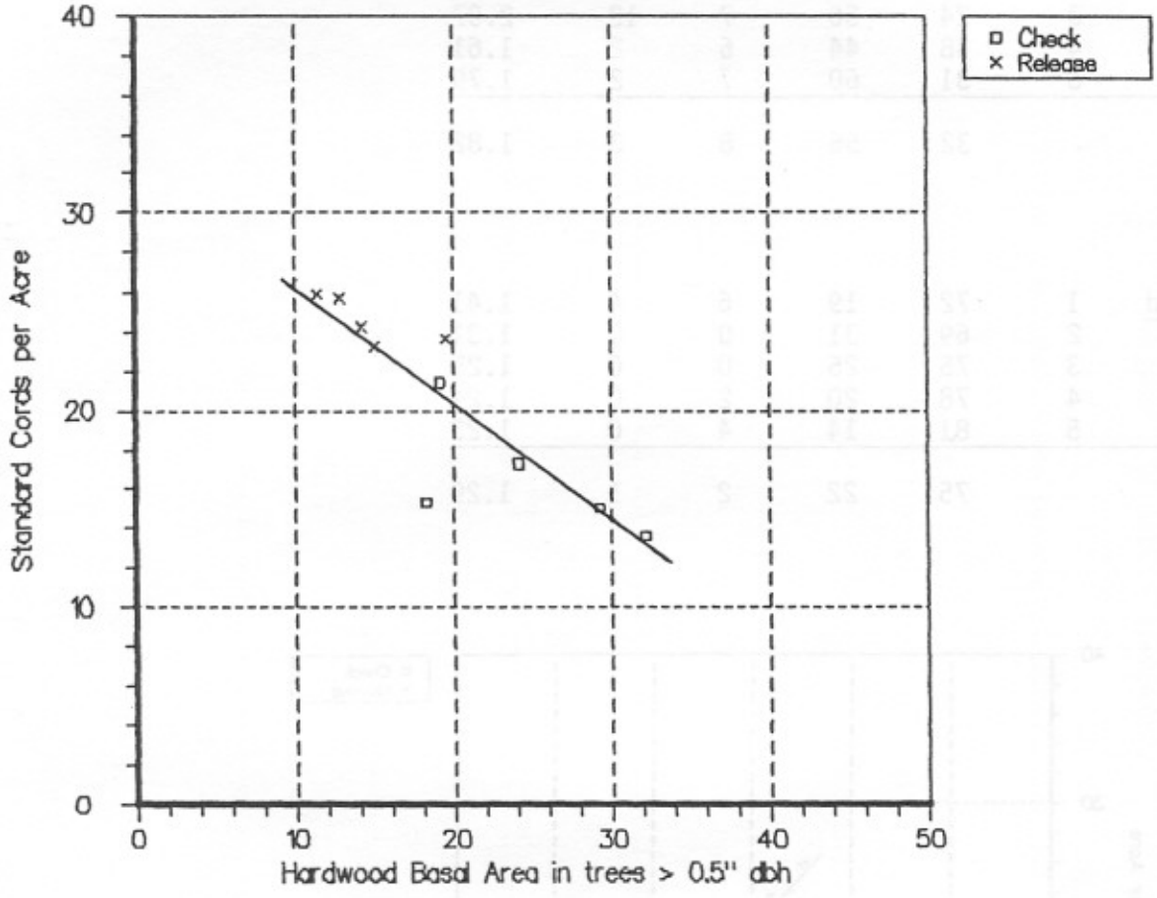

Figure 2. Pine cordwood yields at age 16 related to hardwood basal area.

Table 7. Percent of trees by free-to-grow class for each plot, at age 3.

		FTG				
	Plot	1	2	3	4	Means
Check	1	33	56	10	0	1.77
	2	6	63	11	0	1.84
	3	24	56	7	12	2.07
	4	48	44	6	2	1.61
	5	31	60	7	2	1.79
Means		32	56	8	3	1.82
Released	1	72	19	6	4	1.41
	2	69	31	0	0	1.31
	3	75	25	0	0	1.25
	4	78	20	2	0	1.24
	5	81	14	4	0	1.23
Means		75	22	2	1	1.29

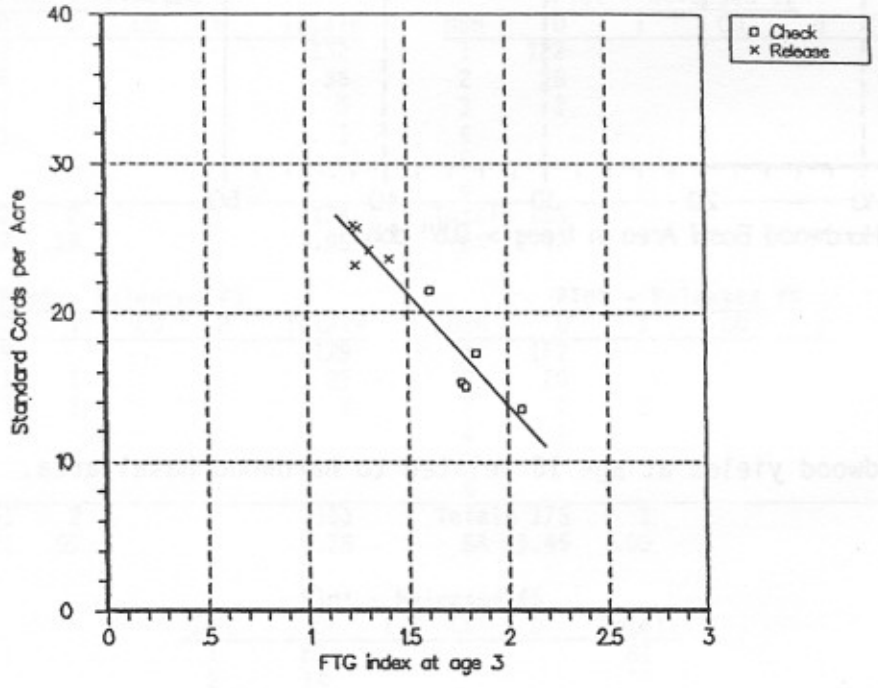

Figure 3. Pine cordwood yields at age 16 related to FTG index.

the check plots. Hardwood competition seems to have affected height of dominant and codominant pines, as we have noticed in other release studies.5/ A plotting of average dominant and codominant height of loblolly pine at age 16 over hardwood basal area, for all 10 plots, shows a nearly significant relationship between pine height and hardwood competition.6/ There was an even stronger relationship between dominant and codominant height of loblolly pine and the free-to-grow index estimated at age 3 (Figure 4).7/

5/ See Occasional Report 75 (Release Report 8) for a discussion of this relationship and its probable cause.

6/ Estimated pine height = 44.71 - .1375 (hardwood basal area), r^2 = .334, probability of a larger F = .080.

7/ Estimated pine height = 48.81 - 4.3764 (free-to-grow index at age 3), r^2 = .639, probability of a larger F = .006.

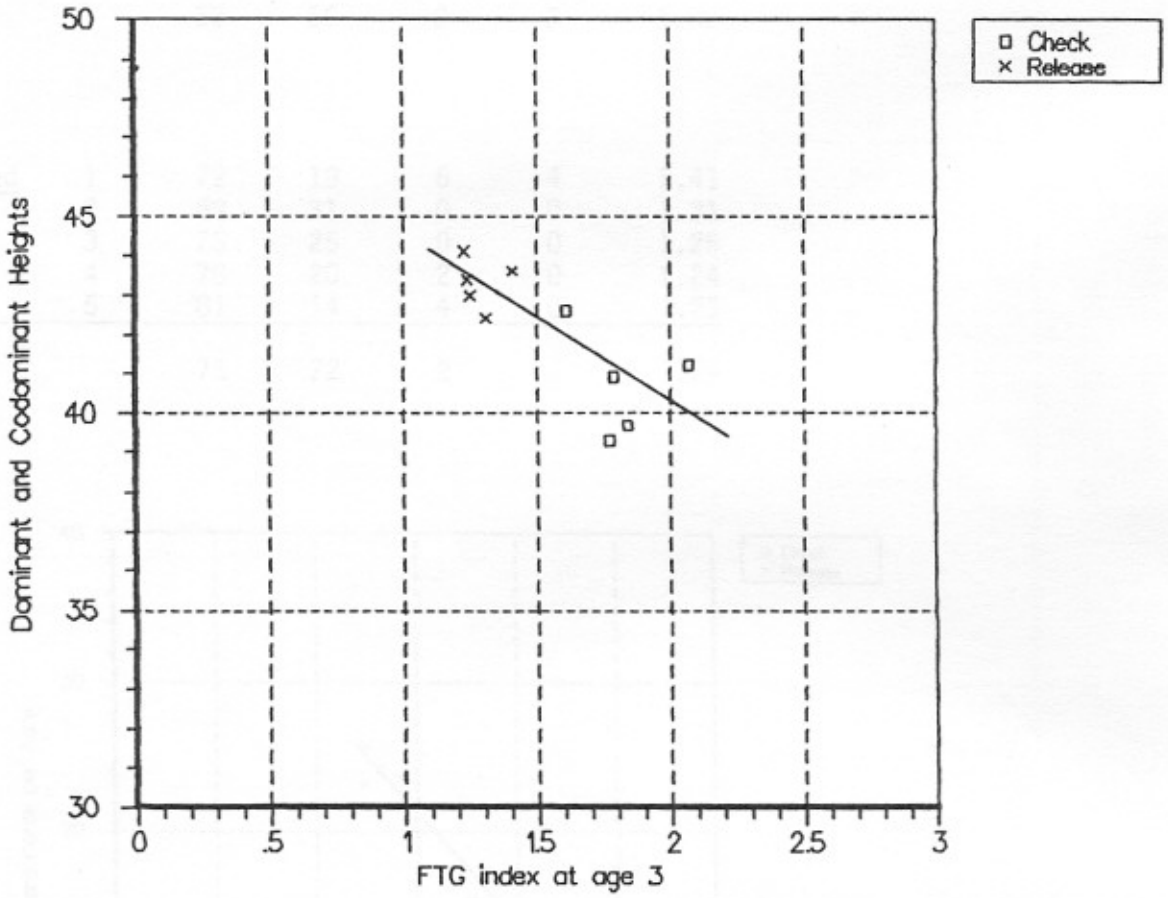

Figure 4. Dominant and codominant height at age 16 related to FTG index.